



## **REALSYSTEM PROXY 8 OVERVIEW**

RealSystem iQ White Paper

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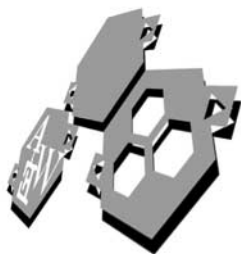
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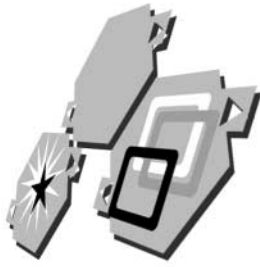
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## REALSYSTEM PROXY 8 OVERVIEW

### Audience

RealNetworks® RealSystem® Proxy™ 8 (Proxy 8), as part of the RealSystem iQ, introduces new technologies—called Neuralcast Technologies™—for intelligent media delivery through distributed networks, ensuring the reliable delivery of your broadcasts. This white paper is targeted at system administrators, architects, and technology managers interested in deploying Proxy 8 for any of the following purposes:

- Managing streaming media over a network
- Delivering live broadcasts over a network
- Caching on-demand content for delivery over a network

### Introduction

This white paper highlights the features and benefits of deploying RealSystem® Proxy™ 8 in an enterprise or intranet environment. It assumes a general understanding of network architecture and IP protocols, as well as familiarity with streaming media technologies developed at RealNetworks. For a better understanding of these new technologies, see the glossary and the links to other resources at the end of this paper.

For additional configuration and usage information, see the *RealProxy Administration Guide* at <http://service.real.com/help/library/guides/proxy2/proxy.htm>, and see the ReadMe document that accompanies RealProxy. This ReadMe file is continuously updated; you can always find the most up-to-date version of it at <http://service.real.com/help/library/guides/proxy2/readme.htm>.

### The Evolution of Streaming Media

As the use of streaming media on the Internet has rocketed in popularity among users, the amount of this type of content has grown correspondingly. For example, every week there are more than 350,000 hours of RealAudio™ and RealVideo™ programming available. More than 1700 live radio stations broadcast using RealAudio®, and over 100 live television stations broadcast in RealVideo®. Indeed, audio and video content has been essentially transformed from a selection of entertainment offerings to a wide range of powerful business tools.

While content has assumed a more central importance in the enterprise environment, the expanded adoption of broadband technology has also made this content more compelling, as increased bandwidth makes it possible to stream more complex presentations. The challenge today for those administering intranet environments with streaming media is control—that is, managing the exchange of streaming media content in a measured, secured, cost-efficient manner that does not jeopardize mission-critical applications or quick access to important information.

This increased presence of streaming media places new demands on the management of network bandwidth. Streaming media not only consumes more bandwidth than do Web pages, it also requires a continuous uninterrupted flow of data to yield the best possible end-user experience, because the client/server connections are persistent. Unlike HTML, images, or downloadable files, streaming media depends critically on consistent and reliable packet delivery over complicated network paths spanning many segments, routers, and switches. Temporary delays (network congestion) and packet loss are more than inconvenient—they affect the smoothness of playback for the end user, and they may also lead to audio dropouts or poor video quality that compromise the overall user experience.

As was mentioned briefly in the preceding section, the use of streaming media content presents several unique challenges:

- *It is bandwidth intensive.* The transmission rate of streamed content can be as low as 28 kilobits per second (Kbps), but is now being encoded as high as 1 megabyte per second (MBps) on the Internet—and even higher in controlled environments. Unmanaged, this vast range of speeds has significant network implications.
- *It requires an uninterrupted flow of data.* For content to be worth watching, the end user must be able to receive a continuous flow of bits. The shorter the distance those bits have to travel, the better the end user's experience will be.
- *It requires different ports than does Web content.* Streaming media travels by means of the Real Time Streaming Protocol, (RTSP), a standard that has been submitted for acceptance to the Internet Engineering Task Force (IETF) (<http://www.ietf.org/>), the protocol engineering and development arm of the Internet. RTSP defines UDP data channels that require additional ports to be opened, which affects issues such as firewalls, authentication, and security.
- *It needs to protect broadcasters' rights.* Unlike with Web content, broadcasters of streaming media require that their content be protected and managed. This prevents streaming media caching from being as loosely managed as Web caching.

In addition to the inherent challenges just described, those who administer corporate intranets need to concern themselves with the protection of their users. For obvious security reasons, most intranet networks are required to mask the IP addresses of individual users. Also, they must deal with the issue of firewall integration, as streaming media content requires different ports than does Web content.

RealNetworks' goal with Proxy 8 is to mitigate these challenges and to provide a reliable, controlled mechanism for delivering streaming media to receiver networks. One version of RealNetworks proxy technology has been publicly available since 1999 through original equipment manufacturer (OEM) partners, as part of integrated streaming media and Web caching solutions. This white paper discusses the new version, the stand-alone RealProxy retail product, which is specific to streaming media. However, the overarching technology is the same for both versions.

## Rationale for RealSystem Proxy 8

For streamed content replication to be cost-effective, it must be simple to deploy, require minimal administration, be completely secure to protect intellectual property rights, and be able to work anywhere in the network without requiring preconfiguration of either the source server or the client. Proxy 8 meets all of these design parameters.

Proxy 8 can store and serve content it receives from any RealSystem<sup>®</sup> Server<sup>™</sup> or RealSystem<sup>®</sup> Proxy<sup>™</sup>. When placed between the source server and the end user in the network, Proxy 8 accepts content from other servers in response to user requests and then re-serves the content to end users. Subsequent requests for the same content are served from the proxy server with permission from the source server. Proxy caches for Web content are widely deployed on the Internet and in corporate intranets today, as they significantly reduce both bandwidth consumption and Web page delivery time. RealNetworks is evolving this same model to add on-demand caching and live stream replication to the rapidly growing percentage of Internet and intranet traffic that is streaming media.

By placing Proxy 8 behind the firewall, the network administrator can control aggregate bandwidth consumption at any time for both live and on-demand activities. Proxy 8 has two modes to enable this: live and on-demand.

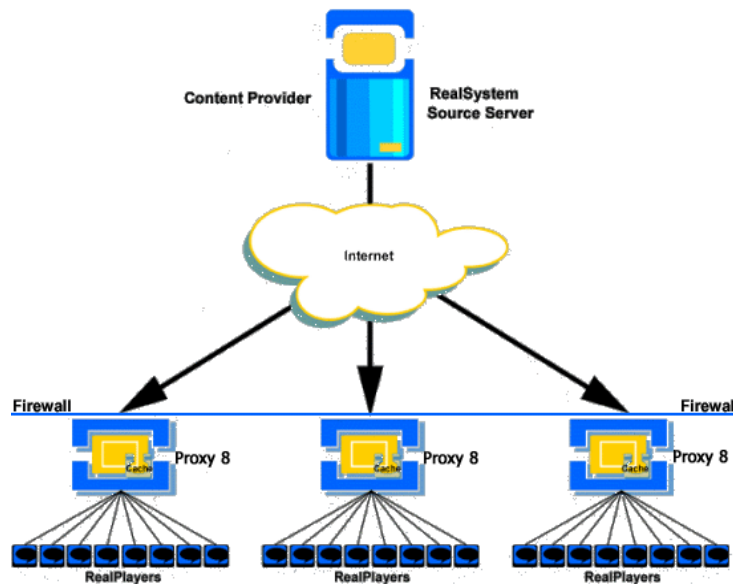
In the live scenario, Proxy 8 acts as a splitter, receiving a single stream of popular content and broadcasting it to all internal RealPlayers<sup>®</sup> that have requested the content. The reduction of inbound streams, from one-to-many down to one-to-one, saves a significant amount of bandwidth.

In the on-demand scenario, content that is requested internally is cached for future delivery, providing greater end-user quality and reducing inbound bandwidth usage. These scenarios work for the entire spectrum of content, whether internal or external to the network. They provide the network administrator with a high degree of control, and they make it possible for RealPlayer users to access high-caliber streamed content quickly and dependably.

Proxy 8 provides a solution for everyone involved:

- Broadcasters send fewer data streams while serving more clients, and they maintain complete control of the content, even when it is stored in the cache.
- Users enjoy an enhanced playback experience.
- Network administrators are happy because their networks are used more intelligently and are less prone to “meltdown” from breaking news events.

### A systemic overview of RealSystem Proxy 8 in a network environment



## Product Overview

RealProxy is software you install on an enterprise network or ISP gateway to manage the delivery of streaming media. The following section explores its functionality in depth.

### Introduction to RealProxy

RealProxy puts audio and video content closer to end users in an efficient, as-needed basis. The solution employs multiple geographically distributed RealProxy servers placed inside the firewall, on a receiver network (a network that receives streaming media). If the client requests content that exists on a nearby RealProxy, the data does not need to be resent from the source server, bandwidth is conserved, and quality-of-service (QoS) is optimized. If the content does not exist on the RealProxy, RealProxy fetches it, serves the client, and stores it for subsequent requests; no bandwidth or QoS benefits are realized for the initial request, but no penalty is paid.

In traditional client/server relationships, each user request for a streaming media clip results in a new connection being established between the client and the source server. With the caching functionality built into RealProxy, however, only the first user request goes to the source server. Each subsequent request is served from the cache, eliminating redundant requests to the source server. As end users request new streaming media files, the cache stores the streaming content in a local file system. If another user requests the same content, RealProxy checks with the source server for authentication, and if granted, delivers the media from its data store.

RealProxy and its associated caching components are built on RealSystem<sup>TM</sup> architecture. Its streaming engine is the same engine used by RealServer. Thus, RealProxy is able to take advantage of the application programming interfaces (APIs) of RealSystem architecture to extend its unique functionality.



RealProxy always maintains a control connection, or accounting connection, to the source RealServer. The proxy server initiates data play to the requesting client only after this connection has been accepted by the source server. The source server treats this connection no differently than it would a connecting client. Statistics sent back to the source server record the duration of playback and the quality-of-service experienced by the client; these statistics are written to the source server's access log.

The RealProxy accounting connection ensures that the source server does not exceed its licensed connection capacity. RealNetworks server products come with a license that governs the maximum number of concurrent connections that a given server can support. By opening an accounting connection to the source server, the proxy server adheres to the stated connection capacity for that source server. If the source server has reached its connection capacity when the proxy server attempts to connect to it, the client is notified with the appropriate message, just as if it were communicating directly with the source server. Client connections look the same in the source server's administration monitor and access logs, regardless of whether or not the clients are connecting through RealProxy.

There are two primary modes supported by RealProxy, as described briefly in the following paragraphs. These modes are discussed more fully later in this white paper:

- **Live splitting:** RealProxy initiates a single data channel for live broadcasts from RealServer and replicates it to connecting clients.
- **On-demand caching:** Upon an initial request for on-demand content, RealProxy acquires media files from RealServer and stores them locally in its cache. Subsequent requests are served from this cache.

In the event that client requests cannot be split or cached, RealProxy creates a pass-through connection to RealServer. While RealProxy always seeks the optimal delivery mode (splitting for live, caching for demand), playback is guaranteed to the RealPlayer in all cases.

## **New RealSystem Proxy 8 Features**

Proxy 8 has improved authentication, routing, and caching.

### **Proxy Authentication**

RealProxy authentication provides a way for you to control the sites visited by RealPlayer. With this feature, you can configure RealProxy to require a valid user name and password before allowing a RealPlayer to access a particular URL.

You can restrict which users can access content originated from specific locations, or you can ensure that only certain users can play streaming media that originates outside your network. You create a list of the sites that all users can visit. If a user requests content from a site not on this list, she is asked for a user name and password. If you have previously created a user name and password for that person, she receives the media. If you haven't created a password, or if the user types it incorrectly, she is denied access.

RealProxy identifies requests for secure content by the host name in the URL.

For detailed information on authentication, see Chapter 12 in the *RealProxy Administration Guide*.

### Proxy Routing

Proxy routing enables you to route RealProxy requests through other RealProxy servers. The main RealProxy that handles requests bound for the Internet is called the *parent proxy*; the RealProxy servers located closest to the clients are called *child proxies*. This feature is designed specifically for enterprise scenarios in which subnet traffic is routed through proxy software.

### Chained Caching

In a chained configuration, RealProxy caches media file in a cascading manner at both the parent and child proxy. Thus, when a RealPlayer requests media from the child proxy, the media will be cached at both the child and parent. This then ensures the most effective use of bandwidth because subsequent requests for that same media file by RealPlayers connecting to the parent proxy will not demand additional bandwidth consumption across the networks linking the parent proxy to the source RealServer.

When a RealPlayer request is initiated at a child proxy, the parent proxy tunnels the live split broadcasts. This serves two purposes: it preserves broadcast quality of service closest to the requesting viewer, and it preserves bandwidth over the network path that links the parent proxy to the source RealServer. For detailed information on these two features, see Chapter 10 in the *RealProxy Administration Guide*.

## Other RealSystem Proxy 8 Features

Proxy 8 has a full set of features that interoperate with other RealSystem components, and ensure intelligent management of your streaming media.

### Proxy for RealPlayer

This feature makes requests for content on behalf of RealPlayer users, and manages traffic inside the firewall by coordinating requests for similar content. This feature also masks end-user IP addresses.

### Splitting Support for Live Broadcasts

Proxy 8 splits a single inbound broadcasting feed to multiple RealPlayers. Thus, it reduces inbound bandwidth usage to a single stream of content during a live event and improves the RealPlayer quality of experience.

### Caching of RealSystem Content

Proxy 8 caches all incoming streaming media traffic originating from a Server 8, and servers cache content locally after authenticating on the source server. This significantly reduces inbound bandwidth usage by eliminating redundant file transmissions across the network, and it improves RealPlayer quality of experience.

### Accounting Connection

This feature authenticates every content request at the source server. The broadcaster can see all of the general usage data and can verify that his users are appropriately authenticated. The end users, meanwhile, are guaranteed the freshest content.

### Aggregate Bandwidth Thresholds

Caps inbound and outbound bandwidth to Proxy 8, thus controlling aggregate bandwidth usage within the network and preventing stress on mission-critical applications.

### Cross-Platform Support

Proxy 8 is available for the following platforms:

- Sun Microsystems Solaris
- Microsoft Windows NT and Windows 2000
- Linux

## Summary of RealSystem Proxy 8 Benefits

Deploying Proxy 8 in an enterprise network provides four main benefits:

- Bandwidth savings
- Intelligent use of the network
- Security
- A high quality of service for end users

### Bandwidth Savings

Because it eliminates redundant data, deploying Proxy 8 can result in significant cost savings. The return-on-investment case for reducing bandwidth consumption is both straightforward and compelling. The costs involved in Proxy 8 deployment include hardware procurement, software licensing fees, administration overhead, and administrator training. RealProxy has been designed from the ground up to minimize these costs. It supports a variety of operating systems, widening the range of hardware choices; and it is simple to install and administer, with minimal training.

The extent of an enterprise's savings depends largely on the cost of network bandwidth and on the amount of bandwidth reduced as a result of using Proxy 8. There are many different ways to measure (and be billed for) bandwidth cost. One straightforward metric is the cost per megabyte (MB) of data transferred; this falls in the range of pennies or fractions of a penny per megabyte. The amount of bandwidth saved is simply the difference between the number of megabytes per second (MBps) that come out of Proxy 8 and the number of MBps that go into it. For example, assuming 1 cent per megabyte as cost, with the in/out difference of Proxy 8 averaging 5 megabytes, the cost savings would be \$540 per day. The following table shows hypothetical cost savings per month for a range of bandwidth costs and bandwidth savings.

Cost of Metered Bandwidth* (cents per MB transferred)	Total Bandwidth Savings per Month (in MBps)				
	1 MBps	5 MBps	10 MBps	15 MBps	20 MBps
3 cents	\$3,348	\$16,740	\$33,480	\$50,220	\$66,960
1	\$1,116	\$5,580	\$11,160	\$16,740	\$22,320
0.3	\$335	\$1,674	\$3,348	\$5,022	\$6,696
0.1	\$112	\$558	\$1,116	\$1,674	\$2,232
0.03	\$34	\$167	\$335	\$502	\$670

(\*For reference, a metered T-1 access line that costs \$1,000 month and averages 40 percent of capacity equals 0.5 cents per megabyte transferred.)

### Network Management

Proxy 8 enables network administrators to control the amount of inbound bandwidth it consumes and the outbound bandwidth it generates for connection requests. The proxy server regulates inbound bandwidth across its pass-through, splitting, and cache transfer mechanisms. Bandwidth is regulated in concurrent bits acquired and concurrent bits served. By managing these parameters, network administrators can ensure that even large broadcasts will not interfere with other mission-critical activities on the network.

### Security

Like other proxy server applications, Proxy 8 masks end-user IP addresses, providing an additional layer of security for the network.

### End-User Quality of Service

In both live and on-demand scenarios, an end user whose connection is situated behind a Proxy 8 will receive a quality of service on a par with or—more typically—superior to that experienced by other users. By bringing content topographically closer to the end user, Proxy 8 significantly decreases the potential for the type of poor quality that can result from network congestion and packet loss occurring over the Internet.

## How RealSystem Proxy 8 Works

Proxy 8 is an application designed to act as a proxy for the delivery of streaming media from the Internet or an enterprise intranet to a managed network. Proxy 8 optimizes data transmission by dynamically determining the best delivery method for each client request for streaming media.

Note that Proxy 8 works for both live broadcasts and on-demand content.

## Live Broadcasts

This section discusses the two basic delivery methods that Proxy 8 supports for streaming live broadcasts to connected clients: splitting streams by means of either UDP or TCP unicast or IP multicasting, and pass-through delivery.

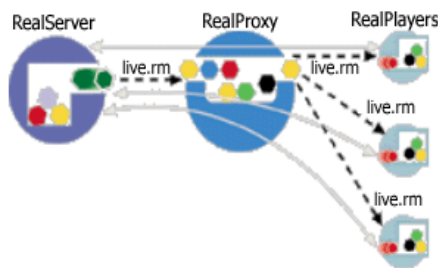
### Splitting

#### Unicasting

After initiating a single data-channel connection to Server 8, Proxy 8 splits live broadcasts for any clients connected to it. Subsequent requests for the same live stream are then delivered from the Proxy 8, without pulling redundant live data from the source server. For each client requesting the live stream, Proxy 8 establishes an accounting connection back to Server 8. This accounting ensures that the RealPlayer is permitted to access the stream and that it forwards unique session statistics back to the source server.

The establishment of the accounting connection to Server 8 enables Proxy 8 to attempt to split all live streaming media broadcasts.

#### Proxy 8 splitting a live broadcast



RealServer versions 6 and later are configured in a manner that permits Proxy 8 to split their live broadcasts.

#### Multicasting

Proxy 8 supports IP multicast. While Proxy 8 cannot join an existing IP multicast channel, it can rebroadcast a live split stream to its connecting clients by way of multicasts. IP multicasts require that:

- The network between the RealPlayer and Proxy 8 is IP multicast-enabled.
- RealPlayer is configured to attempt multicast reception for live broadcasts (this is the default configuration in all RealPlayers).
- Proxy 8 is configured to broadcast multicast channels on a defined IP address range.

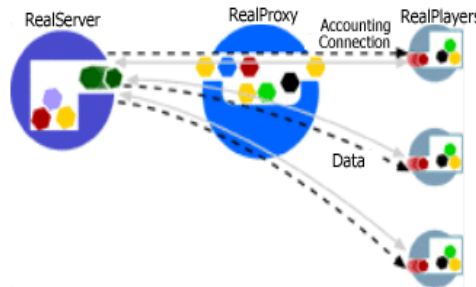
The method of multicasting supported by Proxy 8 is back-channel multicasting, which establishes a Server 8 accounting connection for each client.

### Pass-Through Delivery

If live content cannot be split, Proxy 8 will simply pass the stream through to each connecting client, establishing both an accounting connection and a data connection for each client that has requested the live stream from Proxy 8.

In both the live-splitting and pass-through scenarios, Proxy 8 establishes and maintains the accounting connection to the source server.

#### Proxy 8 in a pass-through scenario



## On-Demand Content

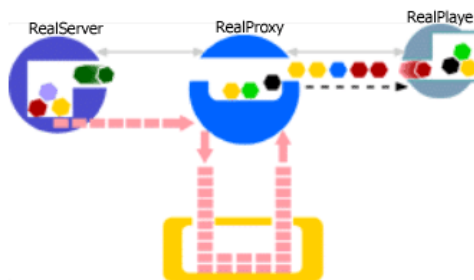
Proxy 8 supports two methods of delivering on-demand streaming media to connected clients: streaming from a local cache, and pass-through delivery.

### Caching

Proxy 8 ships with a streaming media cache. This enables on-demand content to be dynamically replicated locally, in an encrypted format. Proxy 8 attempts to store all cachable media files upon first request.

When a Proxy 8 server receives a client request for on-demand media, it determines whether the content is cachable. Then it checks to see whether the requested media already resides in its local cache. If the media is not already in the cache, Proxy 8 acquires the media file from Server 8 and simultaneously delivers it to the requesting client.

#### Initial RealPlayer request fills the media cache



Subsequent requests for the same media clip can be served without repeatedly pulling the clip across the network from the source Server 8



Proxy 8 never attempts to stream data from cache unless it first establishes an accounting connection to the source Server. If at any time during a cache playback session, the source server goes offline, or becomes unreachable, the proxy server terminates its connection with the client. This way, the proxy server ensures that content delivered from its local cache is synchronized with the original version residing on the source server. Enforcement of the accounting connection also preserves the intellectual property rights of the publisher who is serving the content from the source server.

The cache's design goal was to provide a simple mechanism for storing and retrieving content locally. It has the following basic features:

- A configurable cache size
- An established absolute path to the disk location where the cache resides
- A cache-flush heuristic, based on the age of the content it was last retrieved

#### Pass-Through Delivery

Proxy 8 dynamically switches to pass-through mode for on-demand content if the client request is for media that is not cachable. This will occur if the source Server 8 is version 6 or earlier, or if the server administrator has explicitly marked the content as noncachable.

### Bandwidth Management

Proxy 8 enables network administrators to manage streaming media bandwidth consumption. Each Proxy 8 server has configurable settings that:

- Limit the amount of gateway bandwidth that Proxy 8 acquires from servers.
- Limit the amount of client bandwidth that Proxy 8 generates to fulfill client connections.
- Limit the number of concurrent client connections that Proxy 8 will sustain.

### Configuration and Administration

Proxy 8 is an application-level proxy server and is intended to be run on a computer system largely dedicated to its execution. You can administer all Proxy 8 features remotely by using the RealSystem Administrator, an HTML interface that enables an administrator to control and update Proxy 8.

You can download the final version of RealSystem Proxy 8 from the following Web address:  
<http://www.realnworks.com/products/proxy/>.

#### The Monitor page in the Proxy 8 Administrator

**RealSystem Administrator**

Current RealProxy: **daisy**

**Monitor**

The RealProxy monitors current client connections, the volume of inbound traffic to the Proxy and the volume of network traffic generated by the Proxy.

Definitions:

- Connected Clients is total connected PNA & RTSP clients
- Client Traffic is total traffic generated by the RealProxy for RealPlayers
- Gateway Traffic is total traffic consumed by the RealProxy from RealServers

Connected Clients	98
Total Clients Served	1734

Data Source	Client Traffic	Gateway Traffic
Proxy	2,542,091	172,121
Cache Import		900,891
Splitter Import		64,810
<b>Total</b>	<b>2,542,091</b>	<b>1,137,822</b>

## Deploying RealSystem Proxy 8

The following section describes two prototypical deployments, with guidelines for configuring Proxy 8 in the network environment.

### An Enterprise Gateway and Remote Office Scenario

The following scenario uses the example of a major corporation with numerous satellite offices around the world. It provides top-level recommendations for deploying Proxy 8 successfully.

There are three very important objectives to meet:

- Bandwidth optimization

Optimize enterprise bandwidth use for streaming media, while ensuring that mission-critical intranets are not flooded with streaming media packet traffic. Conserve bandwidth use across costly links that connect the enterprise's wide area network (WAN) to the Internet, and also conserve bandwidth use across dedicated links that connect remote offices to the primary corporate network.

- Security

Allow streaming media traffic onto corporate networks without compromising strict intranet security. Filter or authenticate end-user access to this streaming media content, and ensure that employees comply with corporate policies regarding media consumption.



- Quality of service

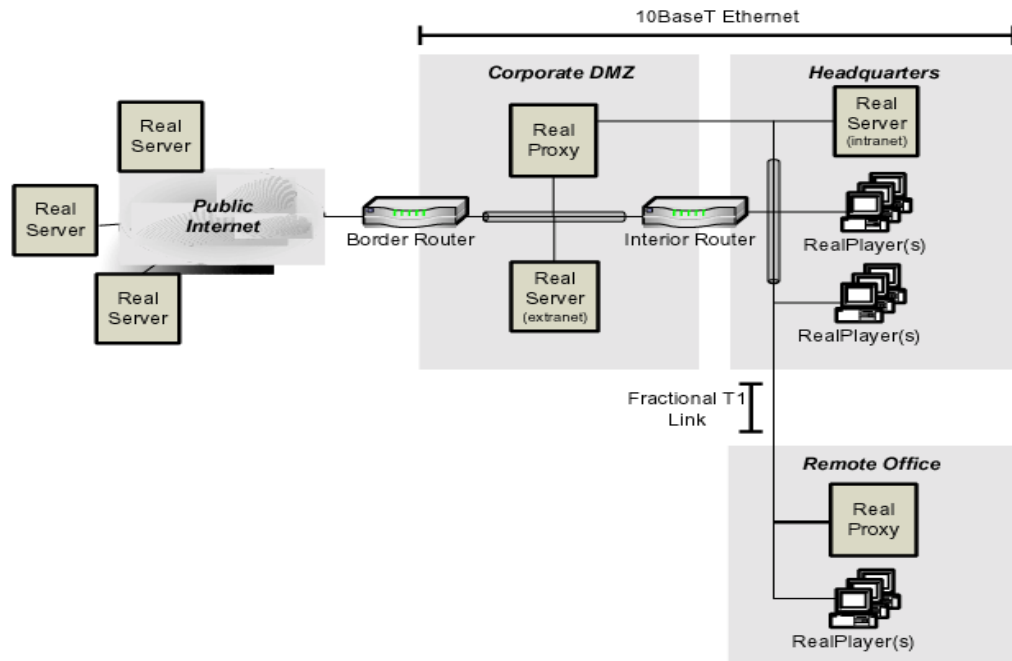
Provide the highest possible quality of service for streaming media to enterprise end users, for both locally hosted and remotely hosted broadcasts.

### Network Description

Internet access is established from the corporate headquarters' local area network (LAN), with branch offices connecting to this LAN through fractional T1 communication links. The number of end users range from dozens to thousands. There is no direct desktop access to the Internet, and the corporation deploys application proxy servers that broker internal requests for externally hosted media and files. Moreover, application proxy servers must authenticate end users before those servers will make external requests on the end users' behalf.

Because branch offices do not access the Internet directly, their Internet-bound traffic must traverse the link connecting them to the corporate LAN before being routed externally.

### An Enterprise Network



The corporation maintains a “demilitarized zone” (DMZ), into which Internet traffic from untrusted hosts beyond the corporate network can enter. A border router connects the DMZ network to the Internet. Hosts residing on the DMZ are assigned routable Internet addresses (Class A, B, or C). The corporation has chosen to run its extranet Web and streaming media servers in the DMZ to serve content to external customers and the general public.

Straddling the DMZ are application proxy servers that broker internal requests for external files from the corporate end users. Because interior routers block these end users from sending or receiving Internet traffic, the proxy hosts are the only conduits available to desktop applications to enable them to reach external destinations.

## Deployed RealSystem Products

Proxy 8 is deployed as a gateway for all Internet-requested streaming media, and it is also deployed at the remote offices to optimize streaming media traffic that occurs over limited bandwidth connections tying the branch office to the headquarters LAN.

RealPlayer Enterprise Edition is deployed on all desktops within the enterprise. The Enterprise Edition offers the same functionality as the basic RealPlayer.

Server 8 is deployed on two of the corporation's networks. Intranet Webcasts are broadcast to end users from a Server 8 deployed on the headquarters LAN. External content is hosted and broadcast to customers, partners, and the general public from a Server 8 running in the DMZ.

## RealSystem Product Configuration

### RealPlayer Enterprise Edition

Proxy 8 Configuration: Proxy 8 configurations are set for each desktop installation of the RealPlayer so that the local proxy specific to that LAN is used, while end users on the headquarters LAN use the Proxy 8 on the DMZ network. Branch office end users use the Proxy 8 deployed on the branch office LAN.

A proxy exception list is also configured in RealPlayer; this means that no proxy is used for end users on the headquarters LAN when they connect to the intranet Server 8.

End users on the branch office LAN use their local proxy for all connections to the headquarters LAN Server 8, thus conserving bandwidth over the link that connects their offices to headquarters.

The administrator can configure the bandwidth setting policy on a per-RealPlayer basis. This “locus of control” uses the connections setting that governs the maximum bandwidth a RealPlayer can request during its session.

Neither of the servers in this scenario needs a unique configuration to function in the enterprise environment.

### Proxy 8

It is important to note that for some features, Proxy 8 deployed in the corporate DMZ—the *gateway proxy*—is configured differently from Proxy 8 deployed in the branch offices. The following table describes these differences.

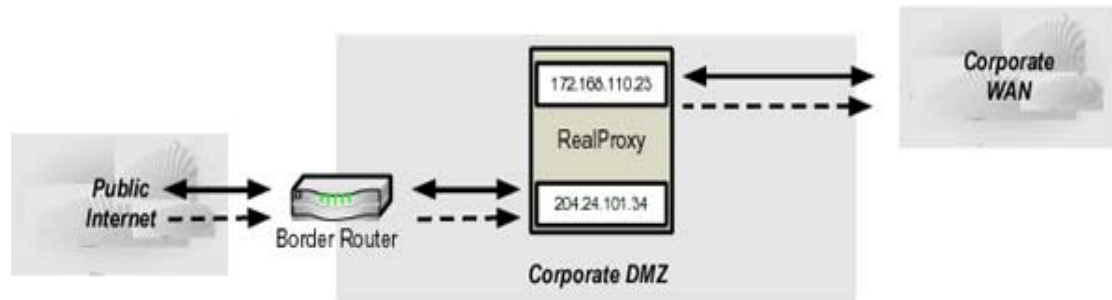
**Proxy 8 Enterprise Deployment Differences**

Feature	Gateway Proxy 8	Branch Office Proxy 8
Proxy Routing	Not configured.	<p>Configured to use the Gateway proxy for all requested connections except those connections to the RealServer on the headquarters LAN.</p> <p>To create Proxy 8 routing rules:</p> <p>If no Server 8 resides on the branch office LAN, create a rule by which all destinations are routed to the parent proxy host name or the address of the gateway proxy.</p> <p>If a local Server 8 does reside on the branch office LAN, add a rule that does not require URL requests to the local Server 8 to be routed to a parent proxy.</p>
Proxy Authentication	<p>Enabled and configured to authenticate all end users' according to corporate policy.</p> <p>To enable authentication:</p> <p>Create rules that will not authenticate connections made through the proxy to the extranet Server 8 that the corporation hosts in the DMZ.</p>	<p>Not configured.</p> <p>Because the Proxy 8 that is deployed in the DMZ gateway authenticates end users' connections for media, the branch office proxy passes end-user credentials up to the gateway proxy to enforce corporate access policies.</p>
		(Table Page 1 of 2)

**Proxy 8 Enterprise Deployment Differences**

Bandwidth Management	<p>Enabled to implement the aggregate bandwidth allotment policy (if one exists) of headquarters LAN.</p> <p>To configure bandwidth management settings:</p> <p>Set the maximum bandwidth, maximum gateway bandwidth, and total concurrent connection settings to comply with corporate policies for streaming media bandwidth consumption.</p>	<p>Enabled to implement the aggregate bandwidth allotment policy (if one exists) of the branch office LAN.</p> <p>To configure bandwidth management settings:</p> <p>Set the maximum bandwidth, maximum gateway bandwidth, and total concurrent connection settings to comply with corporate policies for streaming media bandwidth consumption.</p>
IP Binding	<p>Enabled to listen for incoming connections on the interfaces of the host system that is configured to receive RealPlayer connections from inside the corporate WAN.</p> <p>Proxy 8 will make outbound connections to external servers based on the routing configuration of the operating system of the host it is running on.</p> <p>To configure IP Binding:</p> <p>Make sure that all interfaces used to receive incoming connections from corporate end users' are configured.</p> <p>Make sure that the operating system of the host system will enable the proxy to make outbound connections from the appropriate interfaces so that it is able to connect to servers.</p>	<p>Enabled to listen for incoming connections on the interfaces of the host system that is configured to receive RealPlayer connections from inside the branch office LAN.</p> <p>Proxy 8 will make outbound connections based on the routing configuration of the operating system of the host it is running on.</p> <p>To configure IP Binding:</p> <p>Make sure that all interfaces used to receive incoming connections from corporate end users are configured.</p> <p>Make sure that the operating system of the host system will enable the proxy to make outbound connections from the appropriate interfaces so that it can connect to the headquarters LAN.</p>
		(Table Page 2 of 2)

### RealProxy in an Enterprise configuration



### An Internet Service Provider Access Point

The second scenario uses the example of a large Internet service provider (ISP) with hundreds to millions of users. It provides top-level recommendations for deploying Proxy 8 successfully.

The most important objectives to meet are the following:

- Bandwidth optimization

Optimize bandwidth use for streaming media, especially over the expensive links that connect the service provider access point to “backbone” Internet providers.

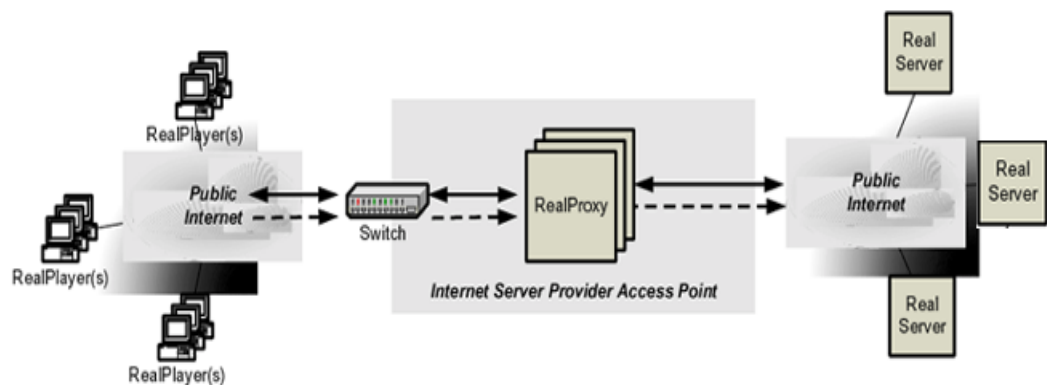
- Quality of service

Provide the highest possible quality of service for streaming media subscribers, for both locally hosted and remotely hosted broadcasts.

#### Network Description

The access provider deploys a cluster of Proxy 8 servers behind a Layer-4 switching device. This Layer-4 switch intercepts and switches all packets bound for TCP port 554 (the known RTSP port) to a Proxy 8 host. Proxy 8 services requests for subscriber RealPlayers by accessing content hosted on the Internet.

#### Proxy 8 in an ISP deployment



## Deployed RealNetworks Products

Proxy 8 is deployed as a gateway for all RealPlayer-requested streaming media that is delivered over the access provider's network.

## RealSystem Product Configuration

### RealPlayer

There is no Proxy 8 configuration needed. RealPlayer is installed by each subscriber without the supervision of the access provider. RealPlayer requests for streaming media are served by Proxy 8 in a transparent manner; that is, the end user receives the files without knowing whether it is a Proxy 8 or a Server 8 handling the streaming.

### Server 8

No unique configurations are required. The access provider does not have an association with the hosted content requested by its end users, or subscribers.

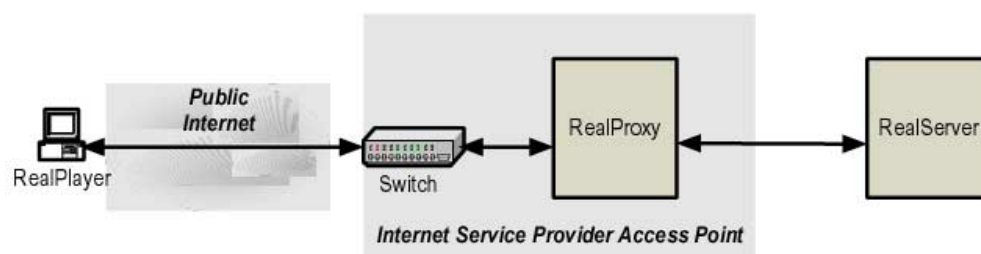
### Proxy 8

You can configure a Layer-4 switch to transparently route RealPlayer requests for streaming media to a Proxy 8. However, this method of finding client proxies applies only to RTSP requests (the PNA protocol, much less commonly used nowadays, does not permit transparent client proxy finding). It assumes that the network topology is set up so that the Layer-4 device can intercept and switch all RealPlayer requests to a Proxy 8 host before they reach the intended destination Server 8.

Specific configuration of the Layer-4 device will vary by vendor; consult the documentation for the switch you are using. To enable the proxy-finding method just described, the Layer-4 device must be able to readdress and overwrite TCP packet headers, based on a user-defined rule.

In this scenario, Proxy 8 must also be configured to enable the RTSP redirector plug-in. The configuration variables you use to enable this plug-in are outlined in the following section. The RTSP redirector plug-in ships with Proxy 8, but it is disabled by default.

### Proxy 8 and a Layer-4 Switch



### Sequence of Events

1. The client makes a request to **rtsp://real.server.com/file.rm**.
2. The Layer-4 switch monitors all traffic from the client's network, and it switches TCP-bound packets for all requests that specify "AnyHost port 554" so that they are sent to the Proxy 8 host and port 554.
3. Proxy 8 has the RTSP redirector plug-in enabled and listening on port 554. The RTSP redirector plug-in issues an RTSP redirect message to the client connections it receives. The

RTSP redirect message contains the Proxy 8 host address and listening port used by the RTSP Proxy 8.

4. The client receives the redirect message. It tears down its connection and makes a new connection to the Proxy 8 host address and port that was previously specified by the RTSP redirect message it received.
5. The new connection is now between the client and Proxy 8. It is assumed that the Layer-4 device will not intercept or switch traffic bound for the Proxy 8 host address and RTSP proxy port.

## Configuration Requirements

### Client

Nothing is required, as the client is not configured to use a proxy.

#### ► To configure Proxy 8:

1. On the `<List Name="Proxy">` line, change `<Var RTSPPort="554"/>` to `<Var RTSPPort="1091"/>`.
2. Add RTSP redirector plug-in settings to the root of the `rmserver.cfg` file:

### Warning

Always make a backup copy of your configuration file before making any changes to it.

```
<List Name="RTSPRedirector">  
  <Var Port="554"/>  
  <Var RedirectToAddress="10.0.0.0"/>  
  <Var RedirectToPort="1091"/>  
</List>
```

Where "10.0.0.0" is the IP address of the Proxy 8 host.

### Layer-4 Switch

Although the exact configuration will be different for each Layer-4 switch, depending on the vendor, there are some general guidelines should follow:

- The device must support port-based switching of TCP traffic with the setting "AnyHost:554" to the Proxy 8 host address and the RTSP redirector plug-in port (which is 554).
- When switching the TCP packet, the device must:
  - Overwrite the packet's IP header, making the Proxy 8 host address the destination address.
  - Overwrite the packet's TCP header, making port 554 the destination port, which is the port used by the RTSP redirector plug-in.

## Protocols, Transports, and Packet Formats

Proxy 8 handles client requests and acts as a proxy for Server 8 media streams by using the Real Time Streaming Protocol (RTSP), the standards-based control protocol for streaming multimedia, and Progressive Networks Audio (PNA), the RealNetworks legacy protocol. Proxy 8 is not an HTTP protocol proxy and thus does not handle any HTTP streaming media requests.

RealSystem supports different types of data transports; these include IP multicast for live broadcasts, and UDP and TCP for both live and on-demand content. Proxy 8 works with connected RealPlayers to determine the best data transport type to use for a given content request.

Data types that are streamed through RealSystem use two primary packet formats, RDT and RTP. RDT is a proprietary packet format native to Server 8. RTP is an Internet-standard data type packet format. Proxy 8 supports both of these packet formats, and will dynamically determine and use the appropriate packet format for the type of data being streamed.

The following table outlines the various protocols, transports, and packet formats that Proxy 8 supports.:

**Protocols, Transports, and Packet Formats Supported by Proxy 8**

Streaming Media Control Protocol	Streaming Media Control Protocol Transport	Data Packet Format	Data Packet Transport	Supported by Proxy 8?
RTSP	TCP	RDT (RealNetworks)	IP multicast, UDP, TCP	Yes
RTSP	TCP	RTP	IP multicast, UDP, TCP	Yes
PNA (RealNetworks)	TCP	RDT (RealNetworks)	UDP, TCP	Yes
PNA (RealNetworks)	TCP	RTP	UDP, TCP	Yes
HTTP (Streaming)	TCP	—	—	No
HTTP (Cloaking)	TCP	RDT (RealNetworks) RTP	TCP	No

## Summary

Proxy 8 is a proxy server application that has been designed to work hand-in-hand with Server 8 and RealPlayer, managing and retransmitting streaming media in an intelligent, reliable manner. It integrates with existing networked systems to provide high-quality streaming media performance and a high degree of control over networks.

Proxy 8 dynamically determines the optimal mode of operation in both live and on-demand scenarios. The result for the network owner is bandwidth savings, control over his or her network, increased security, and a better experience for the end user. For network professionals building a streaming media architecture, Proxy 8 provides the means to effectively manage streaming media distribution.



## Additional Resources

- This guide fully documents RealSystem Proxy 8®. It explains how, in large-scale network deployments, Server 8 works in tandem with Proxy 8 to reduce network traffic by eliminating redundant requests. You will find this book at:  
**<http://service.real.com/help/library/guides/proxy2/proxy.htm>**
- You can download the actual Proxy 8 product at:  
**<http://www.realnetworks.com/products/proxy/>**
- Setting up servers to stream files past firewalls is a commonly performed task. Documentation on how to do this is presented at: **<http://service.real.com/firewall/>**
- You can e-mail our Technical Support team at any time. For the specifics, see the Technical Support form at: **<http://service.real.com/contact/email.htm>**

## Appendix: Proxy 8 Connectivity Requirements

You can use the two RealNetworks streaming media protocols—PNA and RTSP—with any type of packet format and transport for streamed media connections between clients and servers and between proxies and servers.

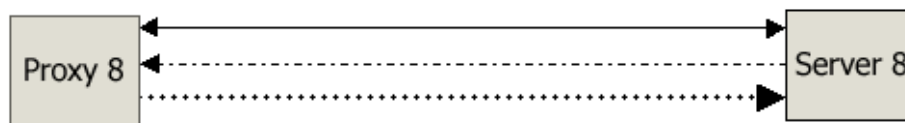
The characteristics of the connection requirements between RealProxy and RealPlayer are identical to those between RealServer and RealPlayer. The tables and diagrams in this section outline the characteristics of the various types of connections you can set up between RealProxy and RealServer.

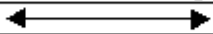
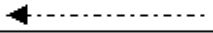

### Pass-Through Delivery: Live or On-Demand Content

Proxy 8 and Server 8 Connection Characteristics

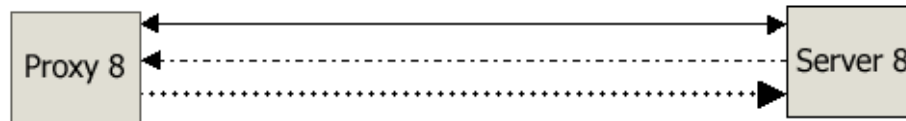
Control Protocol and Data Transport Support	RealServer Interoperability	Proxy 8 Supported?
PNA UDP	RealServers 5 and earlier	Yes
PNA TCP	RealServer 5 and earlier	Yes
RTSP UDP	RealServer 6 and later	Yes
RTSP TCP	RealServer 6 and later	Yes

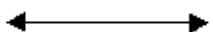

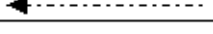
#### RDT Data Playback/UDP Transport



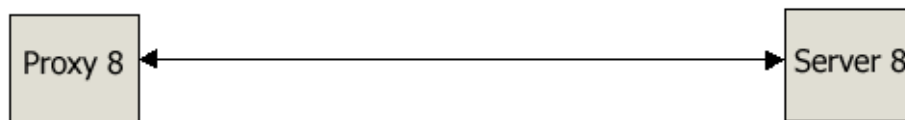
Connection Legend	Description
	Full-duplex TCP streaming media control connection.
	Simplex UDP channel used for delivering streaming media.
	Simplex UDP channel used to request resends for packets lost over the data delivery channel.


#### RTP Data Playback/UDP Transport



Connection Legend	Description
	Full-duplex TCP streaming media control connection.
	Simplex UDP channel used for RTP data delivery.
	Duplex UDP channel used to send synchronization information from Server 8 to Proxy 8, and to send packet loss information from Proxy 8 to Server 8.

#### RDT or RTP Data Playback/TCP Transport

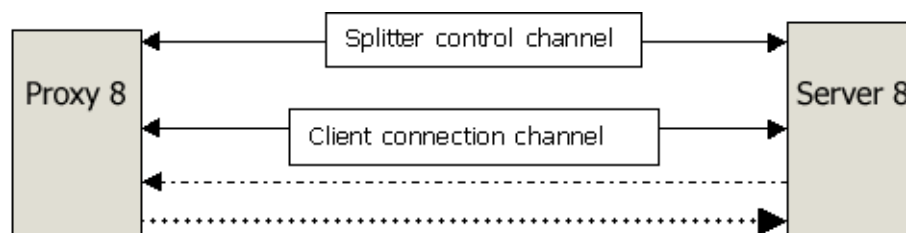


Connection Legend	Description
	A single full-duplex TCP connection is used for both streaming media control and data delivery of either RDT or RTP packets. The data channel is interleaved with the protocol control connection.

## Proxy Splitting: Live Content

Control Protocol and Data Transport Support	RealServer Interoperability	Proxy 8 Supported?
RTSP UDP	RealServer 7 and later	Yes
RTSP TCP	RealServer 7 and later	Yes

### RDT Data Playback/UDP Transport



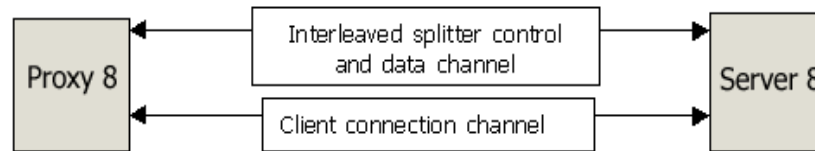
Connection Legend	Description
	RTSP splitter control channel: full-duplex TCP streaming media control connection used to establish the master connection between Proxy 8 and Server 8 for the split data. Only one splitter control channel exists between Proxy 8 and Server 8, regardless of the number of unique RealPlayers being served the live stream by the proxy server.
	RTSP connection control channel: full-duplex TCP streaming media control connection established by Proxy 8 for each unique RealPlayer connecting to the live split broadcast. This connection is used to account for each player at the source Server 8.
	Simplex UDP channel used for delivering streaming media. One UDP channel is established per live stream. Only one split data channel exists between Proxy 8 and Server 8, regardless of the number of unique RealPlayers being served the live stream by the proxy server.
	Simplex UDP channel used to request resends for packets lost over the data delivery channel. Like its companion data channel, only one resend channel is established between Proxy 8 and Server 8.

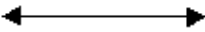

### RTP Data Playback/UDP Transport

This scenario is identical to that described and illustrated in the preceding RDT section, except that here the UDP resend channel is full duplex and is used to send synchronization information from the source server to the proxy, and to send packet loss information from the proxy to the source server.

**RDT or RTP Data Playback/TCP Transport**

You can configure the Proxy 8 splitting mechanism to establish a TCP connection to the source server for the acquisition of live split data.



Connection Legend	Description
	<p>Interleaved splitter control and data channel: single full-duplex TCP connection is used for both the RTSP streaming media control and data delivery of either RDT or RTP packets. The data channel is interleaved with the protocol control connection.</p> <p>When Proxy 8 is configured to use TCP for the splitter data transport, this interleaved channel is established between the proxy and source server. Only one interleaved channel exists, regardless of the number of unique RealPlayers being served the live stream by the proxy server.</p>
	<p>RTSP connection control channel: full-duplex TCP streaming media control connection established by Proxy 8 for each unique RealPlayer connecting to the live split broadcast. This connection is used to account for each Proxy 8-connected player at the source server that is generating the live broadcast.</p>

**Proxy Splitting: IP Multicasting to Connected RealPlayers**

Control Protocol and Data Transport Support	RealServer Interoperability	RealProxy Supported?
RTSP IP Multicast	RealServer 7 and later	Yes

Proxy 8 can generate an IP multicast for its connected RealPlayers, serving the live content that the proxy server has acquired through a live pull-split stream. Because Proxy 8 supports back-channel multicasting, it initiates a distinct RTSP accounting connection to the source Server 8 for each RealPlayer joined to its IP multicast.

For Proxy 8 IP multicasts, the connection characteristics between Proxy 8 and Server 8 are identical to those for Proxy 8 pull splitting. By default, Proxy 8 does not attempt to broadcast IP multicast packets when it has acquired a live pull-split stream. For information on enabling this feature, see the *RealProxy Administration Guide* at

**<http://service.real.com/help/library/guides/proxy2/proxy.htm>.**

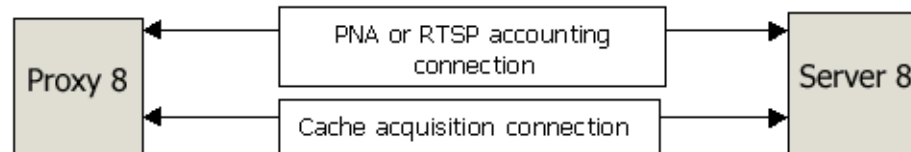
## Caching of On-Demand Content


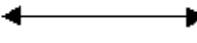
Proxy 8 acquires files from Server 8 through a reliable TCP connection that it establishes when it receives RealPlayer-initiated requests for cachable streaming media. The cache acquisition connection is persistent during the entire playback of content from the cache. This is necessary to verify that the stream in the cache mirrors the corresponding file that resides on the source server.

In addition to the cache acquisition connection, Proxy 8 maintains persistent accounting connections to the source server, corresponding to RealPlayer requests. The accounting connections use either the PNA or RTSP protocol, depending on the control protocol used by the source server to stream the file.

Control Protocol and Data Transport Support	RealServer Interoperability	Proxy 8 Supported?
PNA or RTSP UDP	RealServer 7 and later	Yes
PNA or RTSP TCP	RealServer 7 and later	Yes

### RDT or RTP Data Playback of Cache Media



Connection Legend	Description
	PNA or RTSP accounting connection: full-duplex TCP streaming media control connection established by Proxy 8 for each unique RealPlayer requesting cachable media. This connection is used to account for each player connected to Proxy 8 at the source server that is hosting the cachable media file.
	Cache acquisition connection: full-duplex data transfer connection established by Proxy 8 to acquire files and store them in the cache.





## GLOSSARY

### **B bandwidth**

The amount of data that can be sent to a given computer over a short time, usually expressed as kilobits per second (Kbps). The higher the bandwidth, the faster the computer receives data—very much like using a larger garden hose to get more water faster.

### **C cache hit rate**

The fraction of all requests that can be fulfilled from Proxy 8's built-in media cache.

#### **client**

A software application that receives data from a server. For example, a Web browser is a client of a Web server, and RealPlayer is a client of Server 8 or Proxy 8.

### **F firewall**

A security device used to protect a company from unauthorized access to its servers. A firewall ensures that all communication between an organization's internal network and the Internet conforms to the organization's security policies. It does this by using either proxy services or packet filtering.

### **H HTTP**

Hypertext Transfer Protocol. The command and control protocol used by Web servers to communicate with Web browsers.

### **I IP multicasting**

A method of broadcasting events to multiple destinations over the Internet. In this mode, a single computer can create the content (a concert or a film, for example) and deliver the stream to many computers simultaneously.

### **L live splitting**

A method of data delivery in which Proxy 8 serves a single live stream to multiple clients. Proxy 8 opens a separate accounting connection to the source server for each client.

### **live multicasting**

A method of sending a single live stream to multiple clients, rather than sending a separate stream to each client. If Proxy 8 is configured with live splitting enabled and the network supports multicast delivery, you can configure Proxy 8 to transmit IP multicast data to all of its connected clients.

**M media cache**

The Proxy 8 cache plug-in that enables Proxy 8 to store on-demand co, from where it can be accessed to fulfill subsequent client requests.

**N Neuralcast Technologies**

Neuralcast Technologies aggregate the capacity of many servers into the power of one, creating a self-aware network where all servers seamlessly talk to each other and make instantaneous decisions about capacity sharing, optimization, and redundancy. Proxy 8 is an integral component of this network.

**O origin RealServer**

*See source RealServer*

**P PNA**

Progressive Networks Audio. A proprietary protocol that Server 8 supports for backward compatibility with RealSystem versions 3 through 5. URLs using PNA start with **pnm://**.

**pull splitting**

A method of streaming media delivery in which the link on the Web page lists both the splitter and the source server. When the splitter receives a request for the live audio or video file, it opens a connection to the source server, which then streams the file to the splitter, which, in turn, streams it to the requesting client.

**push splitting**

A method of streaming media delivery in which a constant connection is maintained among the splitters and the push source server, resulting in faster connections for the first client that requests a given split stream.

**Q quality of service (QoS)**

The actual quality of the end-user experience, measured by how closely the experience reproduces the playback experience when no network is involved (for example, playing content from a local hard disk).

**R RDT**

Real Data Transport. The proprietary data package protocol that Server 8 uses (along with RTSP) when communicating with RealPlayer.

**RTP**

Real-Time Protocol. The open, standards-based, data-package protocol that Server 8 uses (along with RTSP) to communicate with RTP-based clients.

**RTSP**

Real-Time Streaming Protocol. The client/server standards-based protocol designed specifically for serving multimedia presentations. Only by using RTSP can you deliver SureStream™ files, whose multiple-bandwidth capability enables them to serve each connected computer according to its available bandwidth.



**receiver network**

A company's wide area network (WAN) that receives streaming media from RealProxy and broadcasts it to clients (RealPlayers, for instance).

**replication**

The automated creation of multiple copies of a live or on-demand streaming media file, at a point in the network between the source server and the RealPlayers.

**S source Server 8**

A server that stores streaming media files and serves them to Proxy 8 on request. In the context of RealNetworks documentation, the generic *source server* is synonymous.

**streaming media**

Large audio, video, or animation files that are broken up into smaller chunks, or data packets, and delivered by a server to users in such a way that the users can play them immediately, rather than having to wait for the entire files to finish downloading.

**T TCP**

Transmission Control Protocol. One of the TCP/IP group of information languages, or protocols. TCP is more reliable than UDP but is often slower.

**U UDP**

User Datagram Protocol. One of the TCP/IP group of information

languages, or protocols. UDP is faster than TCP but is often less reliable.

**W Web cache**

A cache designed to store HTTP-controlled objects (such as HTML, GIF, and JPG files), as opposed to a streaming media cache, which stores audio and video files.

**Webcast**

A broadcast that is delivered over the Internet. Participants can view and hear streaming media, and they can participate in real-time online chats.

